



Climate change effects on agriculture: Economic responses to biophysical shocks

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Abstract:

Agricultural production is sensitive to weather and thus directly affected by climate change. Plausible estimates of these climate change impacts require combined use of climate, crop, and economic models. Results from previous studies vary substantially due to differences in models, scenarios, and data. This paper is part of a collective effort to systematically integrate these three types of models. We focus on the economic component of the assessment, investigating how nine global economic models of agriculture represent endogenous responses to seven standardized climate change scenarios produced by two climate and five crop models. These responses include adjustments in yields, area, consumption, and international trade. We apply biophysical shocks derived from the Intergovernmental Panel on Climate Change's representative concentration pathway with end-of-century radiative forcing of 8.5 W/m². The mean biophysical yield effect with no incremental CO₂ fertilization is a 17% reduction globally by 2050 relative to a scenario with unchanging climate. Endogenous economic responses reduce yield loss to 11%, increase area of major crops by 11%, and reduce consumption by 3%. Agricultural production, cropland area, trade, and prices show the greatest degree of variability in response to climate change, and consumption the lowest. The sources of these differences include model structure and specification; in particular, model assumptions about ease of land use conversion, intensification, and trade. This study identifies where models disagree on the relative responses to climate shocks and highlights research activities needed to improve the representation of agricultural adaptation responses to climate change.

Source: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3948295>

Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Representative Concentration Pathway (RCP)

Representative Concentration Pathway (RCP) : RCP 8.5

Exposure :

Climate Change and Human Health Literature Portal

weather or climate related pathway by which climate change affects health

Food/Water Security, Temperature

Food/Water Security: Agricultural Productivity

Temperature: Fluctuations

Geographic Feature: ☒

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ☒

resource focuses on specific location

Global or Unspecified

Health Impact: ☒

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation: ☒

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☒

type of model used or methodology development is a focus of resource

Cost/Economic, Methodology, Other Projection Model/Methodology

Other Projection Model/Methodology: Crop yield

Resource Type: ☒

format or standard characteristic of resource

Research Article, Review

Socioeconomic Scenario: Shared Socioeconomic Pathway (SSP)

Timescale: ☒

time period studied

Medium-Term (10-50 years)